

# Air Quality Poster Presentations

- HCHO

Boeke et al. (given by D. Millet) Formaldehyde columns from OMI: Urban vs. background levels and evaluation using aircraft data and a global model

Marais et al. Using OMI HCHO observations as a constraint on isoprene emissions over Africa

- NO<sub>x</sub>

Kang et al. Fast update of NO<sub>x</sub> emission inventory for China: comparison of bottom-up estimates and satellite-based method

Mebust et al. Improved parameterization of wildfire NO<sub>x</sub> emissions using MODIS fire radiative power and OMI tropospheric NO<sub>2</sub> columns

Russell et al. Evaluation of an improved retrieval of OMI NO<sub>2</sub> column using within boundary layer aircraft observations

# Air Quality Poster Presentations

- $\text{NO}_x/\text{VOC}$

Valin et al. Constraints on urban VOC emissions from day of week measurements of column  $\text{NO}_2$

- $\text{NH}_3$

Zhu et al.  $\text{NH}_3$  inverse modeling results using new TES  $\text{NH}_3$  observations and surface measurements

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# **Formaldehyde columns from the Ozone Monitoring Instrument: Urban vs. background levels and evaluation using aircraft data and a global model**

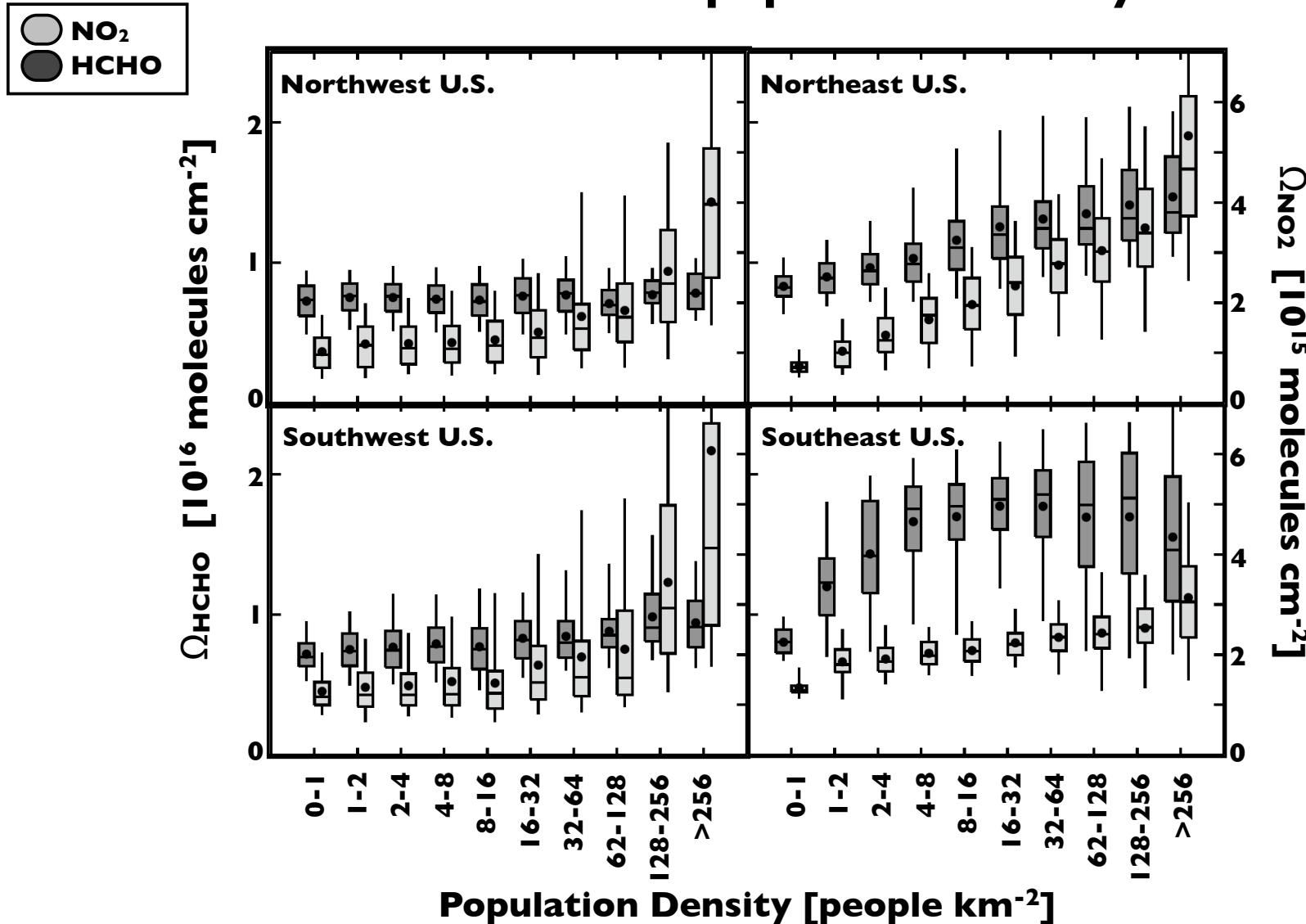
Nicholas L. Boeke<sup>1</sup>, Sergio Alvarez<sup>3</sup>, Kelly Chance<sup>4</sup>, Alan Fried<sup>2</sup>, Thomas Kurosu<sup>4</sup>,  
Bernhard Rappenglück<sup>3</sup>, Dirk Richter<sup>2</sup>, Petter Weibring<sup>2</sup>, James Walega<sup>2</sup>, Julian D.  
Marshall<sup>1</sup> and Dylan B. Millet<sup>1</sup>

<sup>1</sup>Univ. of Minnesota, <sup>2</sup>Nat'l Center for Atmospheric Research, <sup>3</sup>Univ. of Houston, <sup>4</sup>Harvard-Smithsonian Center  
for Astrophysics



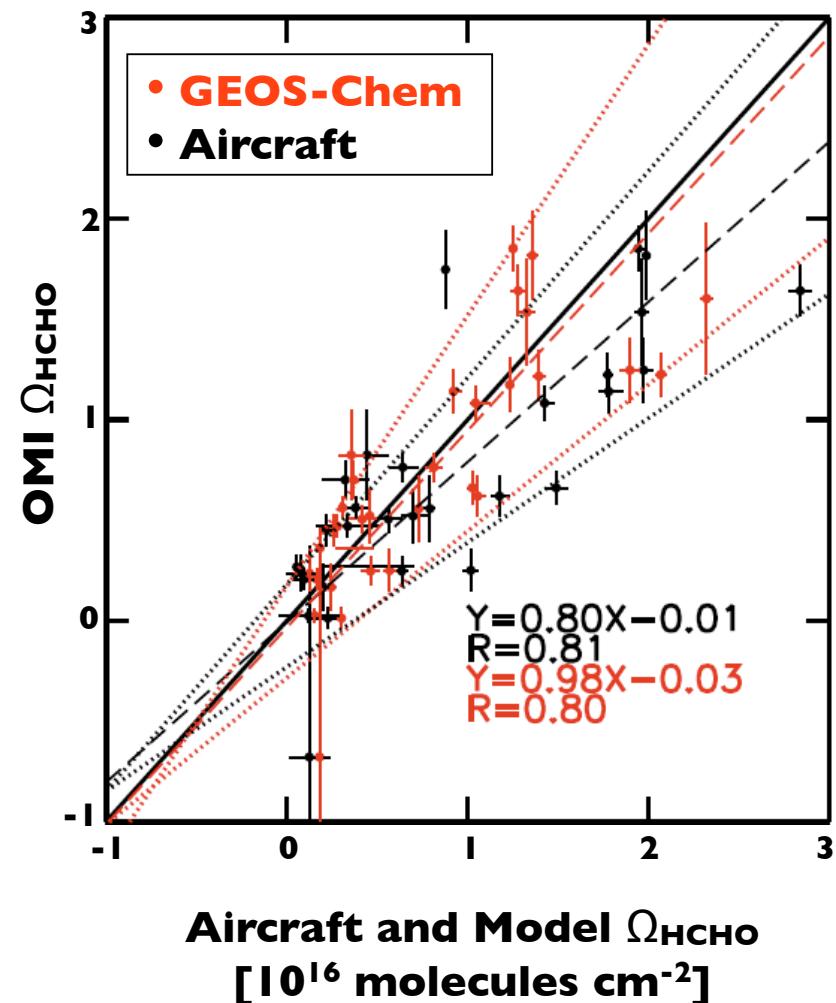
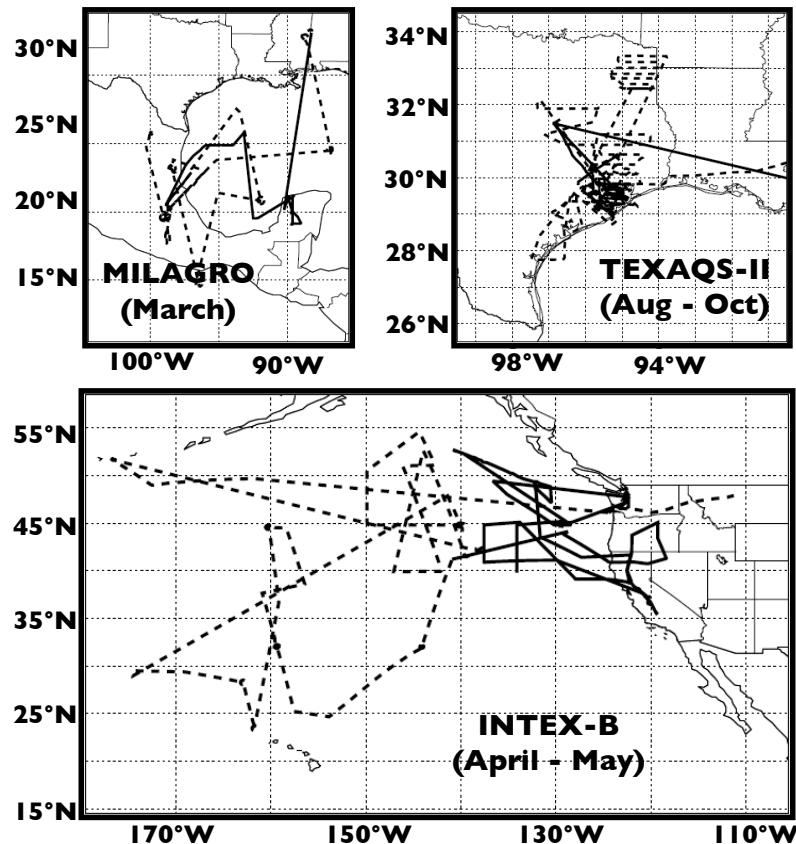
# Spatial and Temporal Gradients in HCHO and NO<sub>2</sub>

OMI  $\Omega_{\text{HCHO}}$  and  $\Omega_{\text{NO}_2}$  over the U.S. (summers 2005-2007)  
as a function of population density



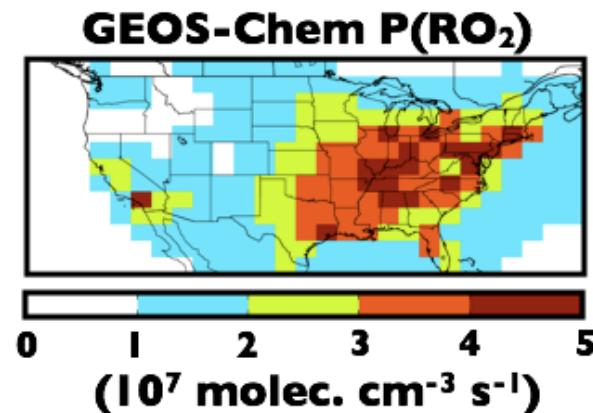
# OMI $\Omega_{\text{HCHO}}$ Evaluation

## 2006 Aircraft Campaigns

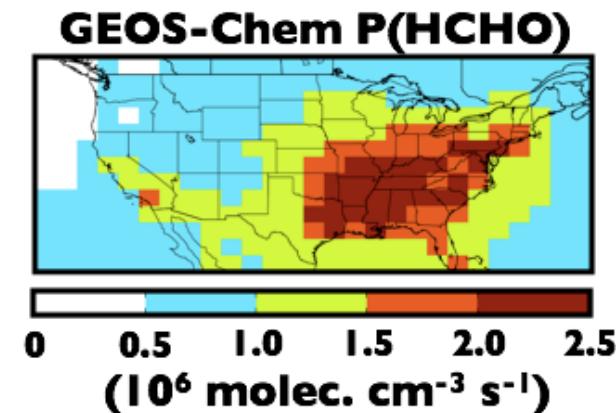


# Ongoing Research: relating $\Omega_{\text{HCHO}}$ to ozone chemistry

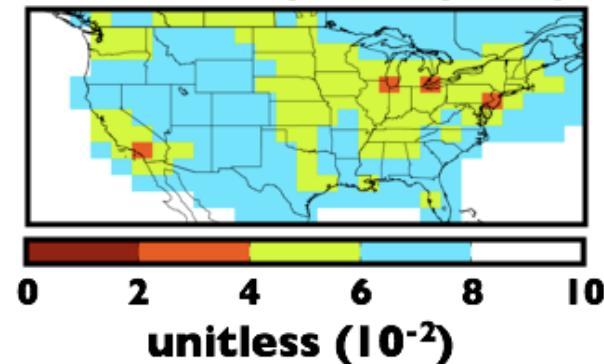
$$\bullet P(\text{RO}_2) = \sum k_i [\text{OH}][\text{VOC}_i]$$



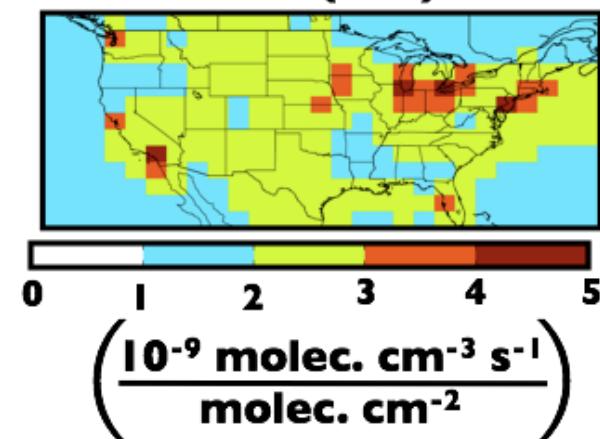
$$\bullet P(\text{HCHO}) = \sum \alpha_i k_i [\text{OH}][\text{VOC}_i]$$



**GEOS-Chem  $P(\text{HCHO}) / P(\text{RO}_2)$**



**GEOS-Chem  $P(\text{RO}_2) / \Omega_{\text{HCHO}}$**



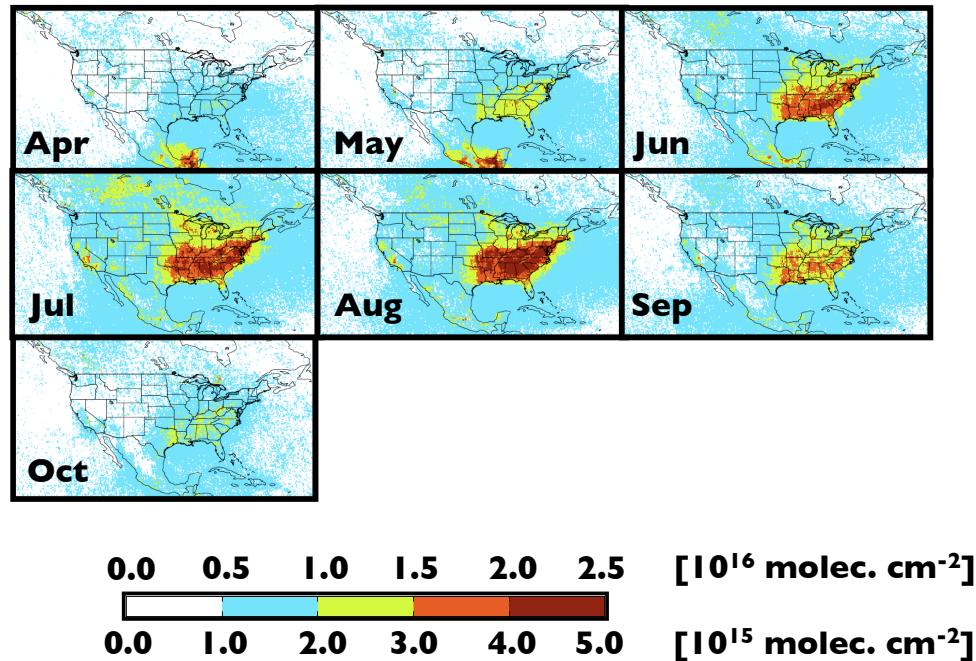
# **Extra**

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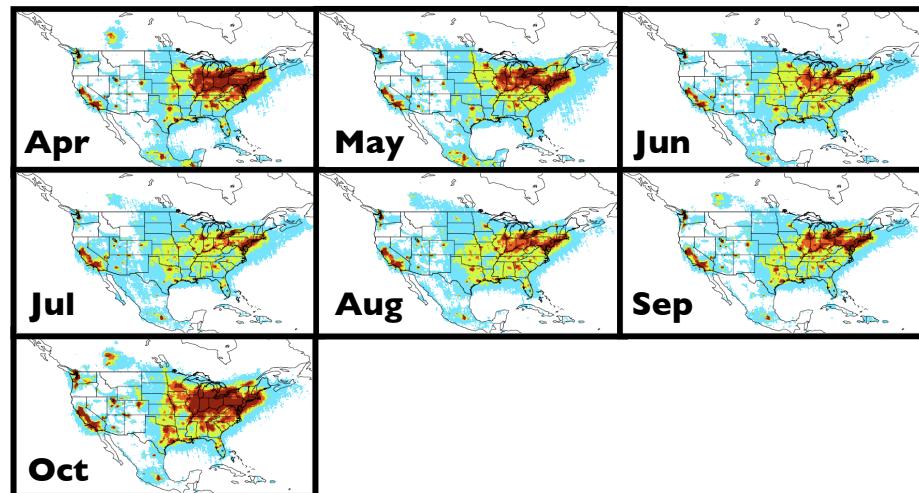
# Spatial and Temporal Gradients in HCHO and NO<sub>2</sub>

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**mean  $\Omega_{\text{HCHO}}$   
(2005-2007)**

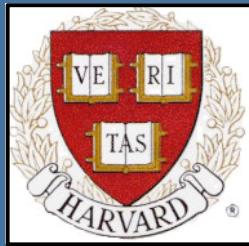
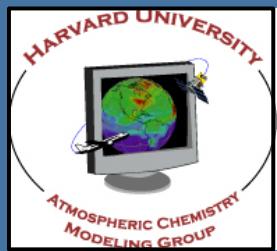


**mean  $\Omega_{\text{NO}_2}$   
(2005-2007)**



# Using OMI HCHO observations as a constraint on isoprene emissions over Africa

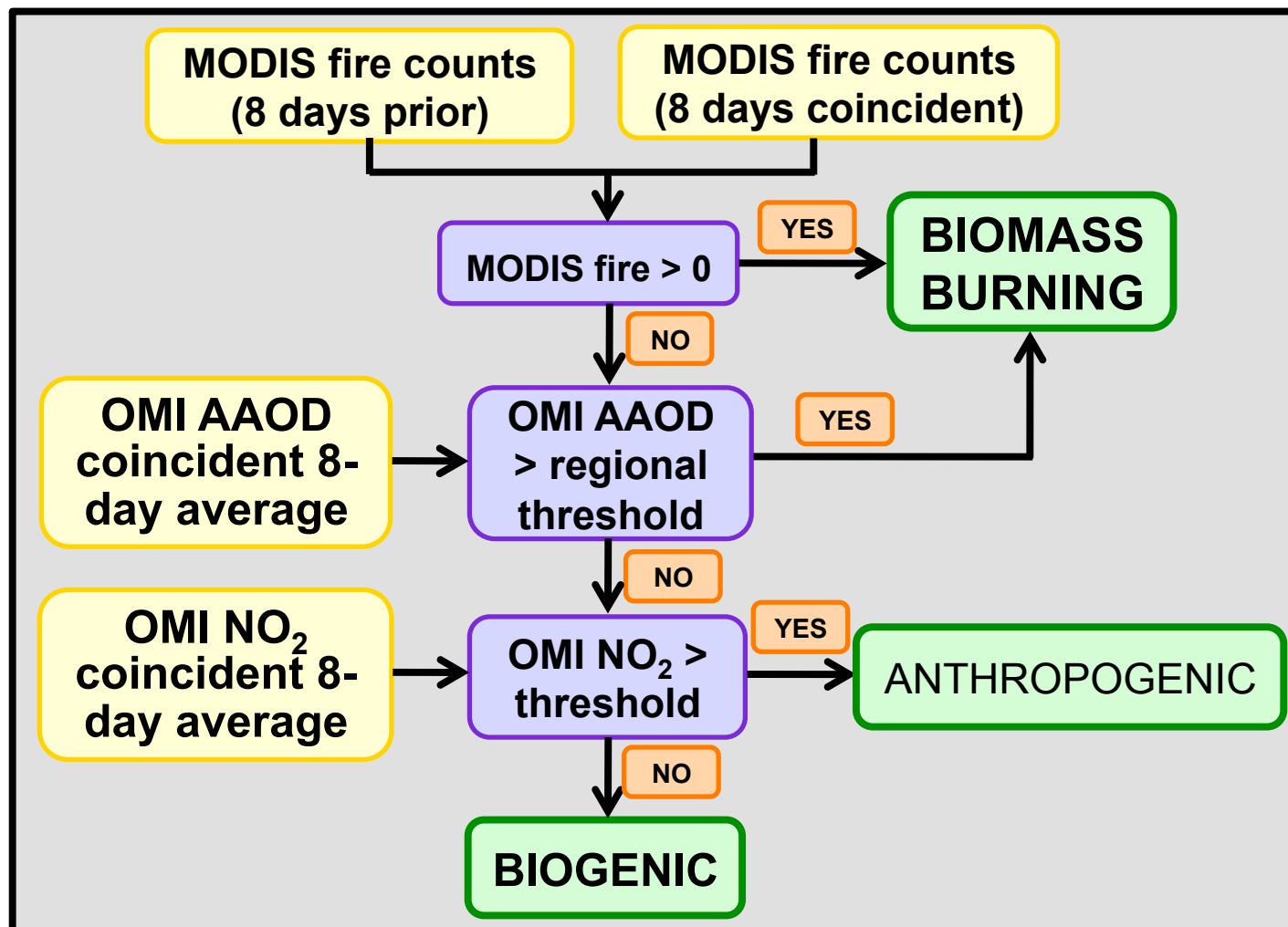
Eloïse Marais, Daniel Jacob, Jennifer Murphy, Dylan Millet,  
Thomas Kurosu, Kelly Chance



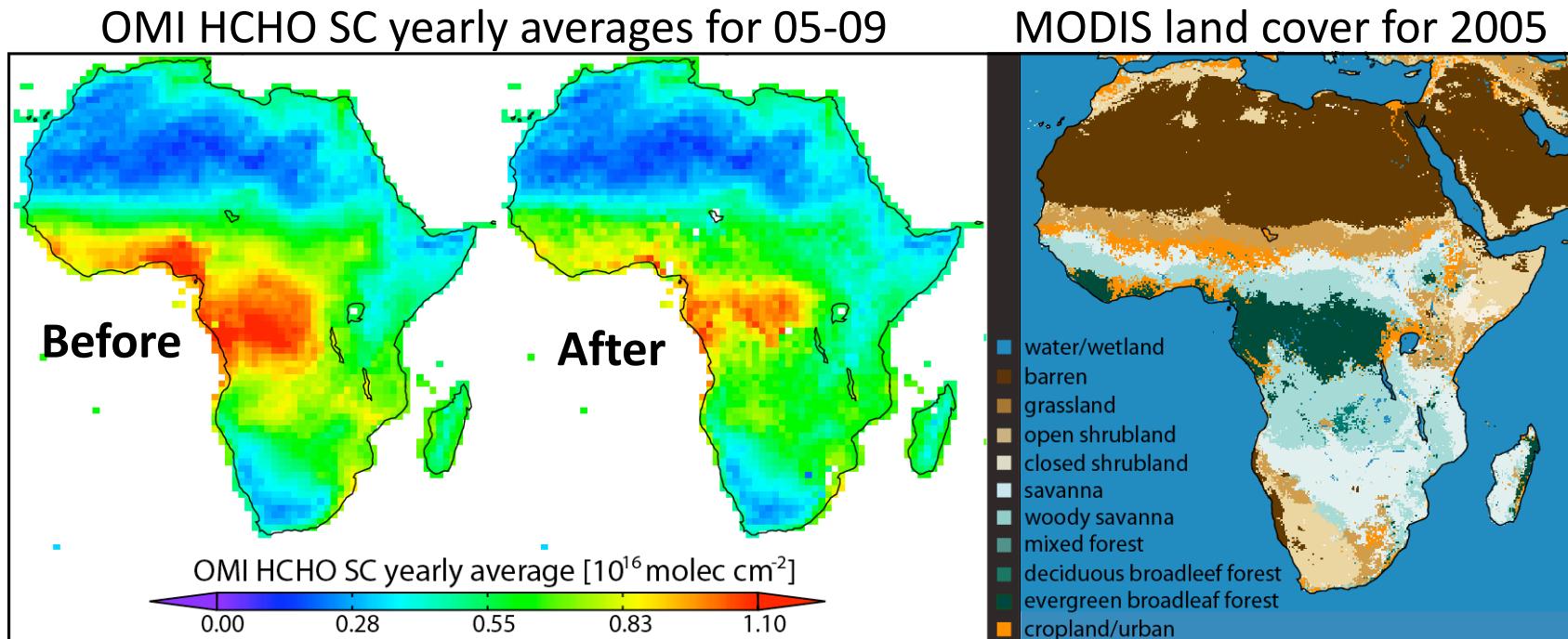
Aura Science Team Meeting, Boulder  
27-29 October 2010

# Filtering Scheme

→ To obtain biogenic signal from OMI HCHO slant column data



# Preliminary Results



- Filtering scheme removes HCHO associated with anthropogenic activity and biomass burning
- The OMI biogenic HCHO columns are spatially consistent with the land cover distribution over Africa
- Small-scale features are evident at 1x1° resolution



# Fast Update of NO<sub>x</sub> Emission Inventory for China: Comparison of Bottom-up Estimates and Satellite-based Method

**Sicong Kang<sup>1</sup>, Qiang Zhang<sup>1</sup>, Kebin He<sup>1</sup>,  
Siwen Wang<sup>1,2</sup>, Randall V. Martin<sup>3</sup>, Lok N. Lamsal<sup>3</sup>,  
Andreas Richter<sup>4</sup>, Hong Huo<sup>1</sup>, and David G. Streets<sup>2</sup>**

<sup>1</sup>Tsinghua University, Beijing, China

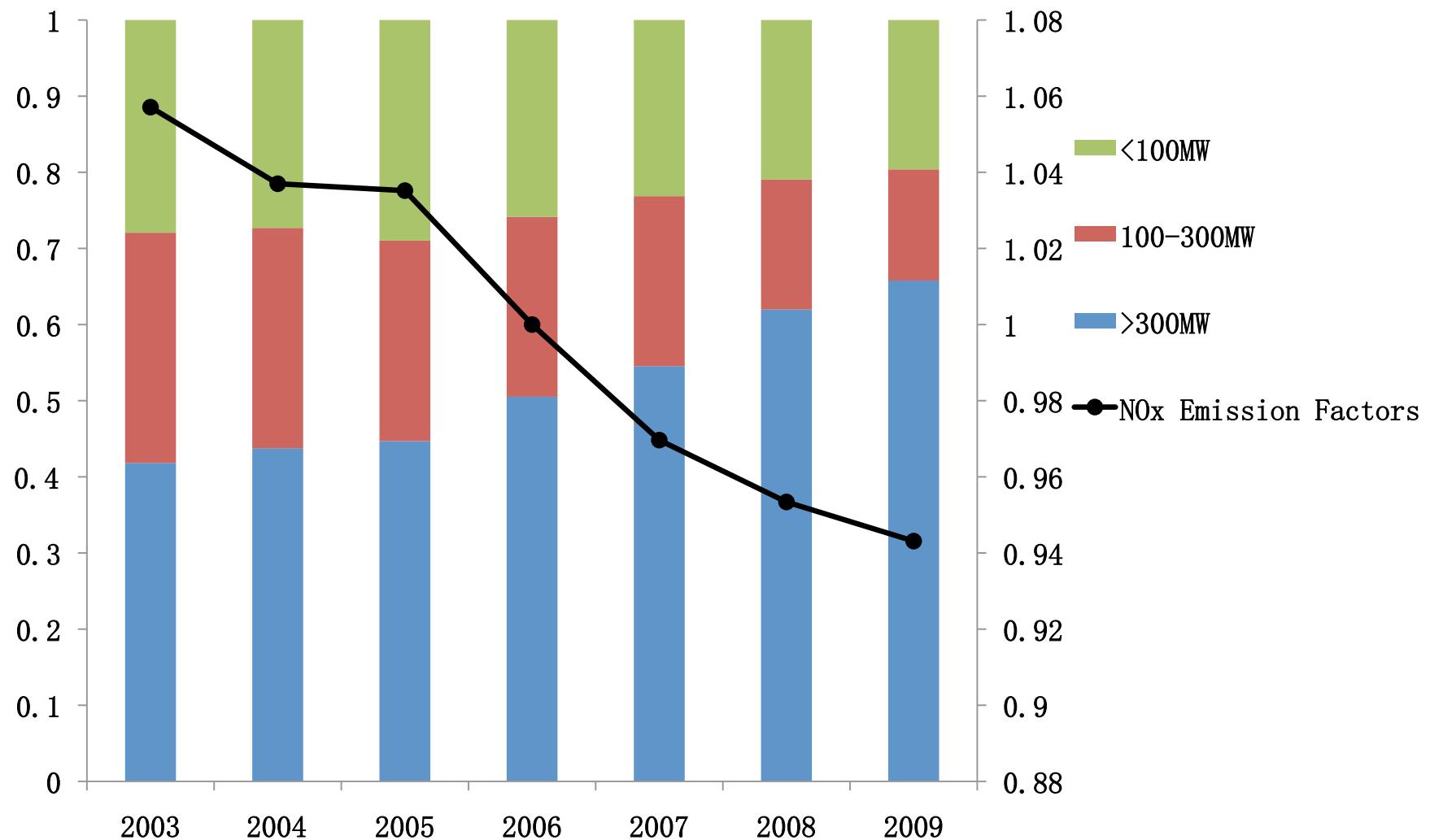
<sup>2</sup>Argonne National Laboratory, Argonne, IL, USA

<sup>3</sup>Dalhousie University, Halifax, NS, Canada

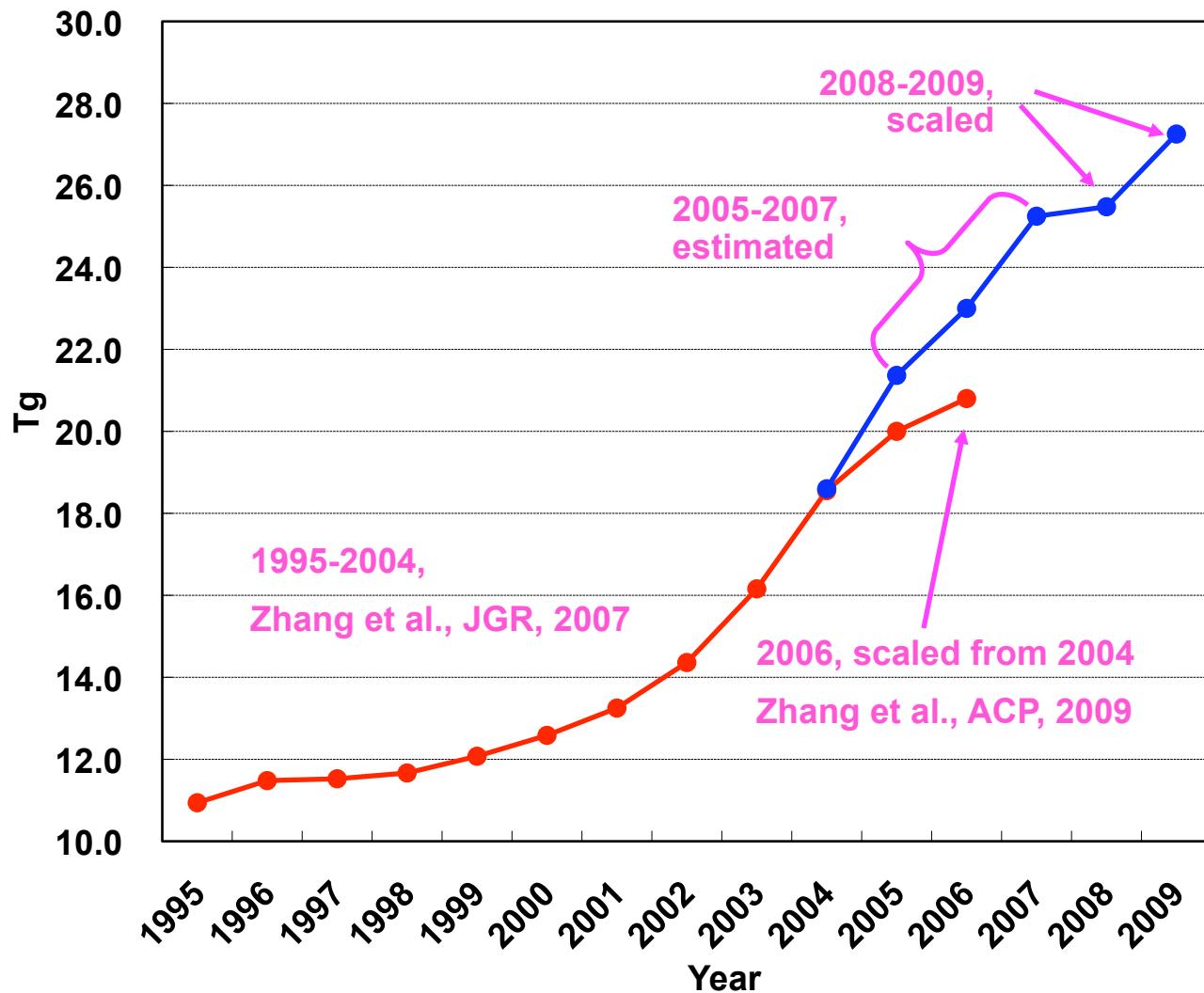
<sup>4</sup>University of Bremen, Bremen, Germany

清华大学

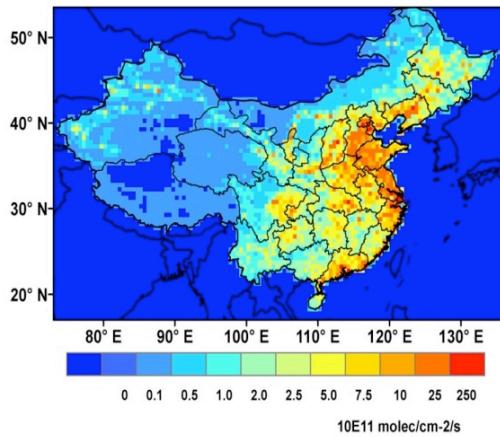
# A new bottom-up method to forecast China's anthropogenic NO<sub>x</sub> emissions



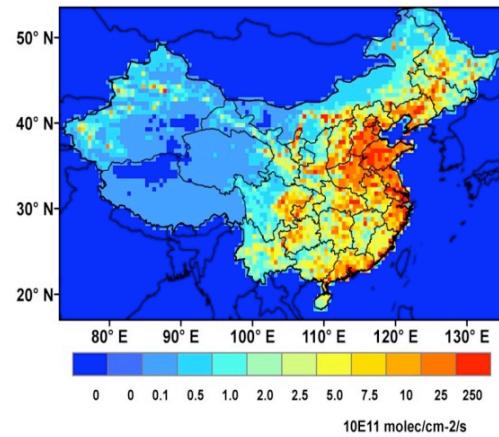
# NO<sub>x</sub> Emission Trends for China: 1995-2009



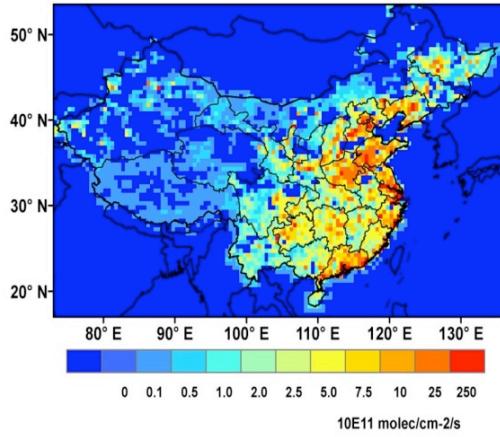
# $\text{NO}_x$ emission distributions at 30 min $\times$ 30 min resolution



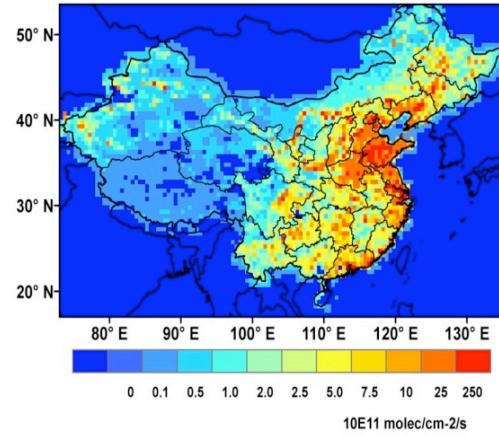
*Bottom-up, 2003, 4.9 Tg N*



*Bottom-up, 2009, 8.4 Tg N*

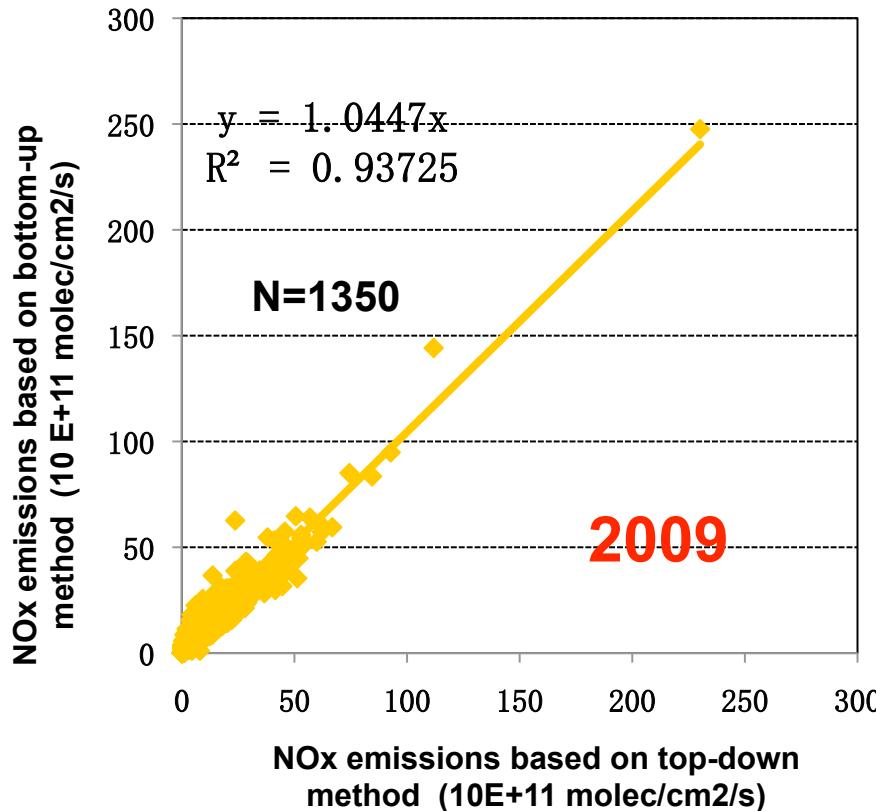


*Top-down, 2003, 5.1 Tg N*

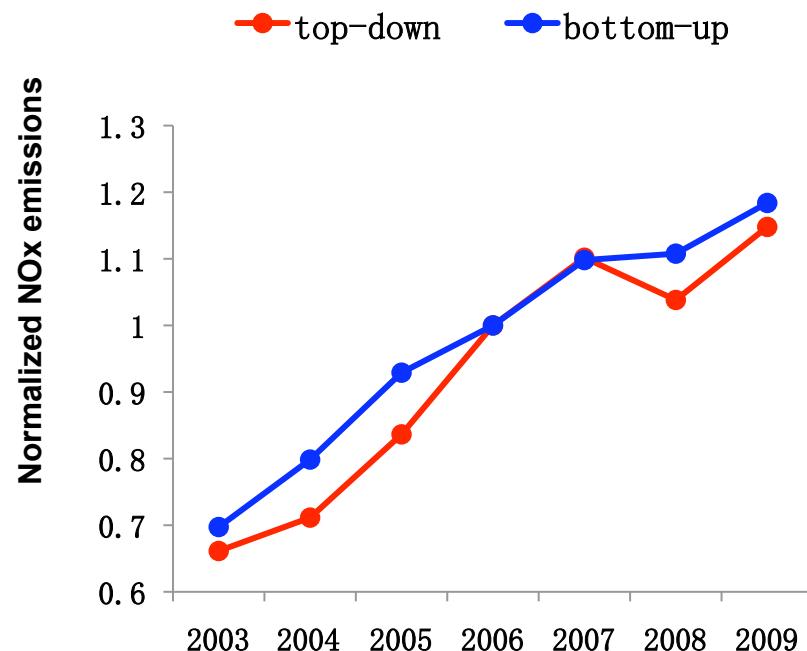


*Top-down, 2009, 8.1 Tg N*

# Comparisons of these two methods



Comparison by grid, 2009

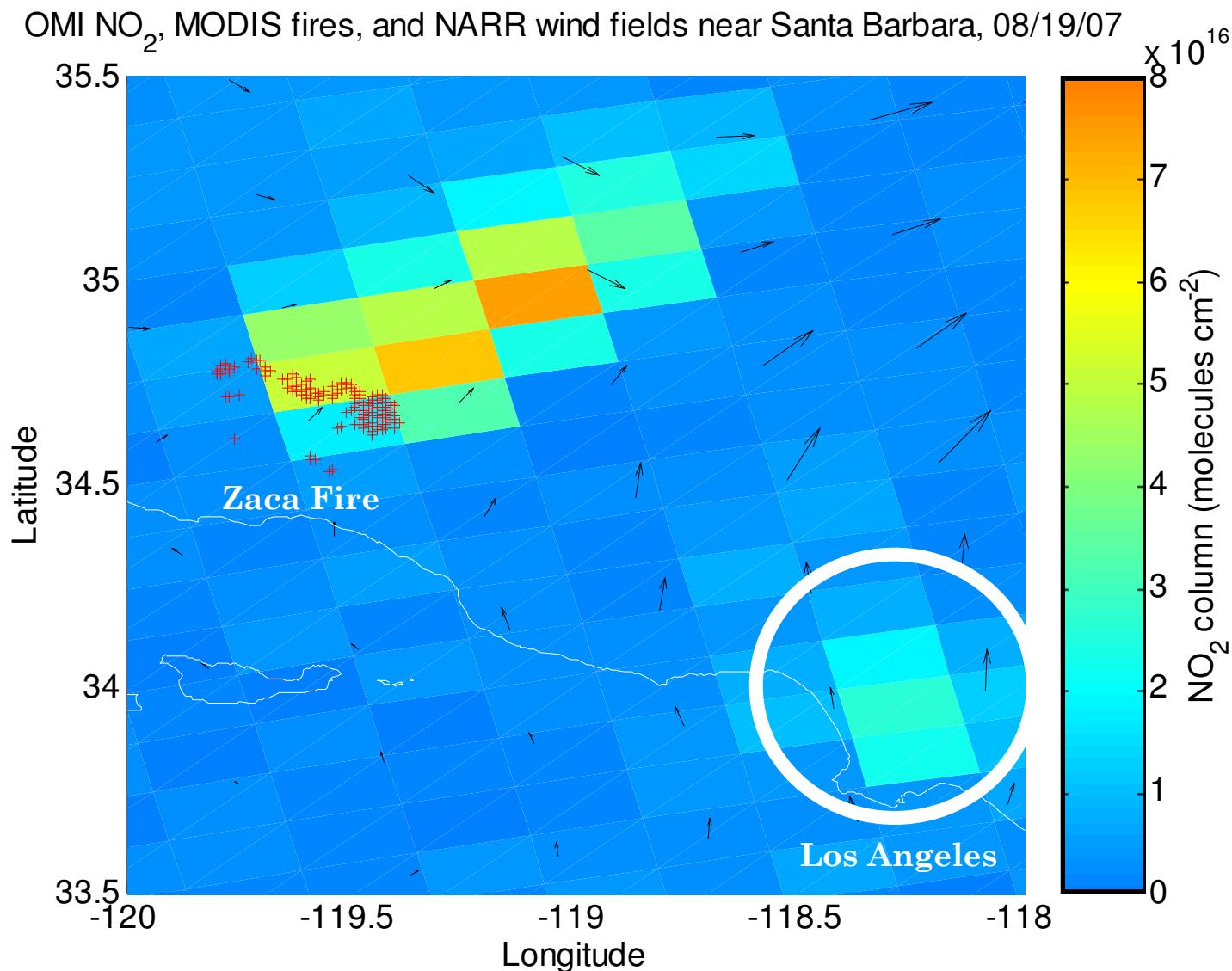


Comparison of the NO<sub>x</sub> emission trends, 2003-2009

**Thanks !**

# Parameterization of wildfire NO<sub>x</sub> emissions using MODIS fire radiative power and OMI tropospheric NO<sub>2</sub> columns

A.K. Mebust, A.R. Russell, R.C. Hudman, L.C. Valin, R.C. Cohen



# Parameterization of wildfire NO<sub>x</sub> emissions using MODIS fire radiative power and OMI tropospheric NO<sub>2</sub> columns

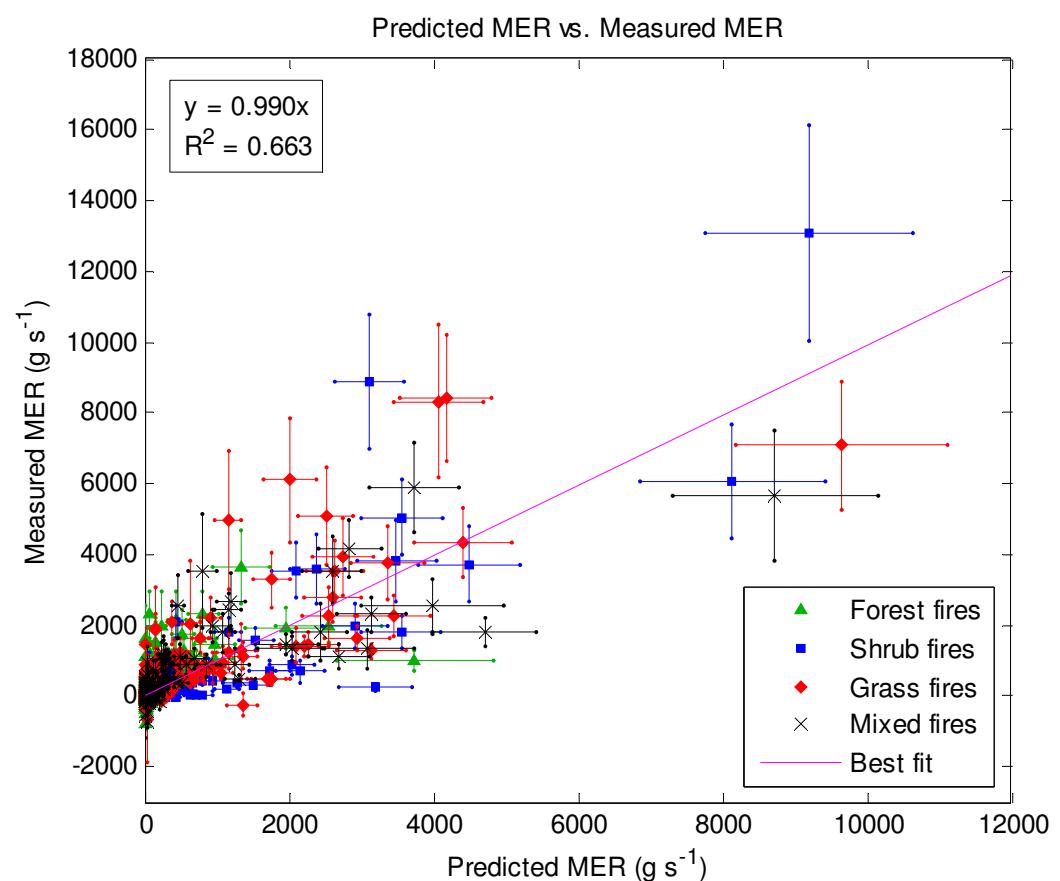
A.K. Mebust, A.R. Russell, R.C. Hudman, L.C. Valin, R.C. Cohen

Land Type	NO <sub>2</sub> ECs (g MJ <sup>-1</sup> )
Forest	0.282 ± 0.083
Shrub	0.65 ± 0.10
Grass	0.336 ± 0.051

S:G:F ratio –

EPA: 2.6 : 1.4 : 1

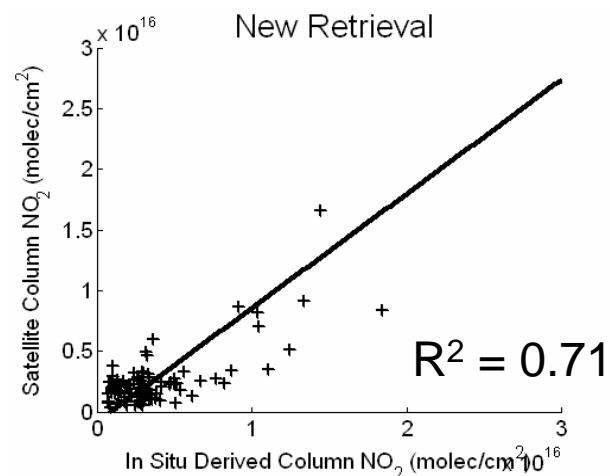
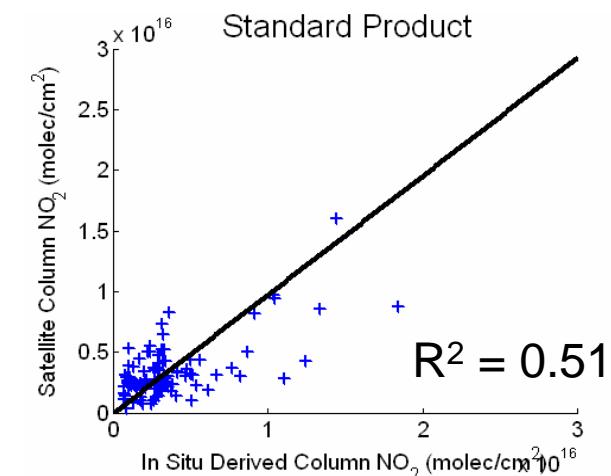
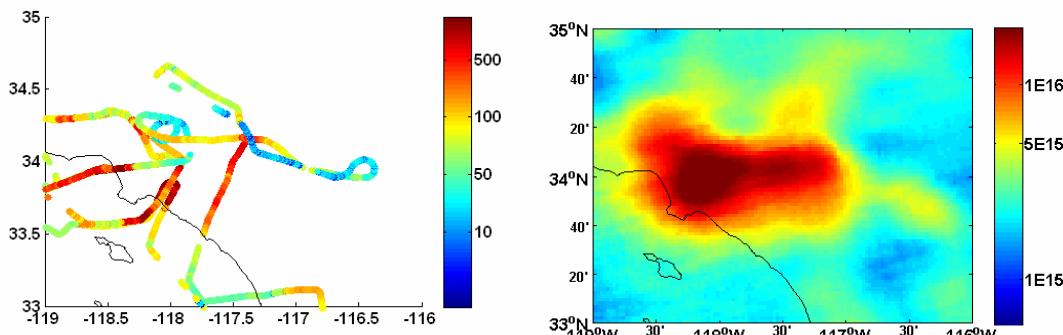
Ours: 2.3 : 1.2 : 1



# Evaluation of an Improved Retrieval of OMI NO<sub>2</sub> Column Using Within Boundary Layer Aircraft Observations

A.R. Russell, A.E. Perring, L.C. Valin, R.C. Cohen

	NASA OMI Standard Product	This Work
Terrain Reflectivity	GOME derived, $1^\circ \times 1^\circ$ , Monthly	MODIS, $0.05^\circ \times 0.05^\circ$ , 16 day
Terrain Pressure	SDP Toolkit 90 arcsec DEM map (pressure @ center of OMI footprint)	GLOBE 1km <sup>2</sup> topo. database avg'd to OMI
NO <sub>2</sub> Profile	GEOS-Chem 2° × 2.5°, Annually	WRF-Chem 4km × 4km, Monthly



Constraints on VOC emissions from day of week observations of column NO<sub>2</sub>  
Luke Valin, A. R. Russell, A. Mebust, R. C. Cohen

OMI NO<sub>2</sub> summer average  
Weekend : Weekday

